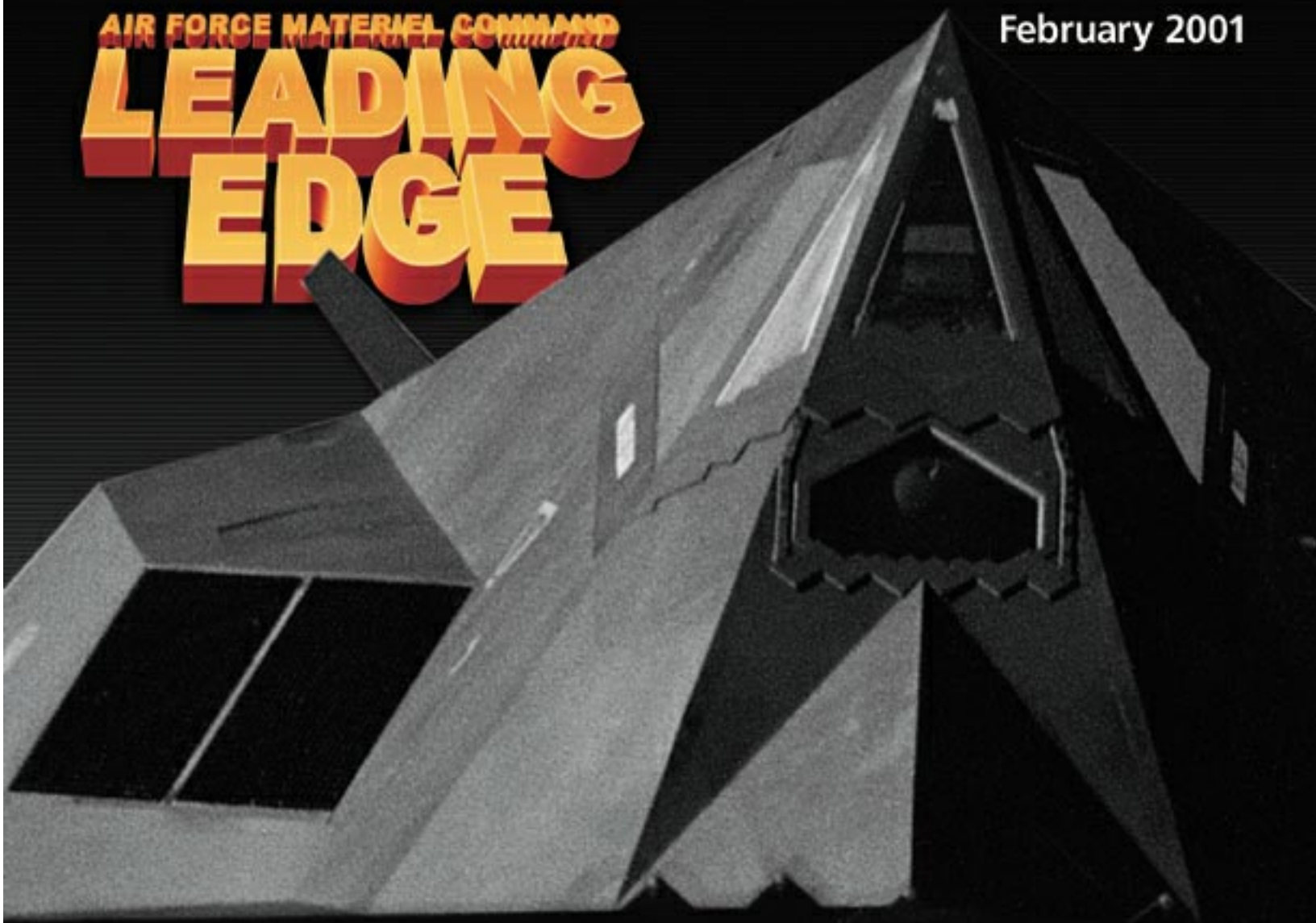


AIR FORCE MATERIEL COMMAND
**LEADING
EDGE**

February 2001



**SUPPORTING THE
WAR FIGHTER**



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Wright-Patterson Air Force
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Department of Defense
Thomas Jefferson Awards
First Place, Magazine Format,
1996
Second Place, 1998, 1997,
1995

Air Force Media Awards
First Place, Magazine Format,
1998, 1997, 1996, 1995, 1994
Second Place, 1993, 1992
Third Place, 1999



This funded Air Force magazine is an authorized publication published monthly for the people of the Air Force Materiel Command. Contents of LEADING EDGE are not necessarily the official views of, or endorsed by, the U.S. Government, the Department of Defense or the Department of the Air Force. The editorial content is edited, prepared and provided by the Public Affairs Office of Headquarters Air Force Materiel Command, 4375 Chidlaw Rd., RM N152, Wright-Patterson AFB, Ohio 45433-5006. The magazine can be found on the Internet on AFMC/PA's home page: https://www.afmc-mil.wpafb.af.mil/HQ-AFMC/PA/leading_edge/index.htm. Photographs are official U.S. Air Force photos unless otherwise indicated. Distribution ratio is 8:1. For submission and writers' guidelines, contact the editor at the above address or DSN 787-7602 or (937)257-1203. Send e-mail to: Elizabeth.VanHook@wpafb.af.mil



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Graphic design by Tech. Sgt. Bill King, HQ AFMC/XP-AO.

4 - 15 Supporting the war fighter...

A FMC is focused on its number one objective — supporting the war fighter. From maintaining and repairing aging aircraft, to developing new technologies, the men and women of AFMC step up daily to challenges that help define America as a superpower and build the greatest Air Force in the world.

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TEST AND EVALUATION



Photo by Mr. Steve Zapka, AFFTC

X-32A makes first supersonic flight

EDWARDS AIR FORCE BASE, Calif. — Boeing's Joint Strike Fighter X-32A demonstrator aircraft expanded its flight envelope Dec. 21 when it broke the sound barrier, meeting another of the program's "up-and-away" test objectives.

Lt. Col. Edward Cabrera, lead X-32 test pilot, took the fighter to 30,000 feet and exceeded Mach 1 (660 mph at that altitude) during the aircraft's 49th flight.

Mr. Frank Statkus, Boeing vice president, said the milestone "puts an exclamation point on what has been a productive flight-test program to date."

The X-32A is more than halfway through a five-month flight-test program, which includes approximately 60 flights totaling about 75 hours to validate the JSF's predicted flying characteristics.

On Dec. 2, Boeing completed all customer-required low-speed handling quality tests, designed to demonstrate flying and handling qualities during aircraft approaches and landings on a simulated aircraft carrier deck. Both government and Boeing pilots participated in the carrier landing practice tests.

The second of the two JSF concept demonstrators, the X-32B, will demonstrate short takeoff and vertical landing capabilities for the U.S. Marine Corps, United Kingdom Royal Air Force and Royal Navy.

— Reported by AFFTC Public Affairs

Minuteman ICBM rocket motor fired at Arnold

ARNOLD AIR FORCE BASE, Tenn. — The Arnold Engineering Development Center fired a Minuteman III Stage 2 solid-propellant rocket motor at a simulated altitude of 100,000 feet in the center's J-6 Large Rocket Test Facility Dec. 12.

The test's purpose was to demonstrate the adequacy of the Minuteman ICBM motor remanufacturing processes and to demonstrate the motor met performance requirements. The test accomplished 100 percent of its objectives.

The motor serves as the second propulsion stage of the Minuteman III Intercontinental Ballistic Missile strategic weapon system.

AEDC has the only test facilities in the world capable of firing high-thrust upper-stage rocket motors under simulated altitude and near-space conditions.

— Reported by AEDC Public Affairs

Structural mode tests complete for JSF X-32B

EDWARDS AIR FORCE BASE, Calif. — Boeing completed structural mode interaction testing of its X-32B concept demonstrator Dec. 10, moving a step closer to first flight.

The X-32B, which is expected to fly during the first quarter of 2001, will validate the Boeing direct-lift approach to short take off and vertical landing flight — one of three customer requirements in the concept demonstration phase of the Joint Strike Fighter program.

During structural mode interaction testing, the aircraft's flight control surfaces are moved at varying frequencies. This evaluation ensures special filters added to the flight control system are functioning properly to prevent vibration in other aircraft components.

To perform short take off and vertical landing maneuvers, a system redirects engine thrust downward through lift nozzles in the airframe. For conventional flight the lift nozzles are closed so thrust flows rearward through a cruise nozzle to propel the aircraft forward and up to supersonic speeds.

In more than 500 trials on the short take off and vertical landing run stand,

transition times between conventional and vertical thrust have been accomplished repeatedly in one to three seconds, which is critically important for unrestricted short take off and vertical landing operations and aircraft safety.

Integration of the attitude-control system with the direct-lift system has been successful.

— Reported by AFFTC Public Affairs

AEDC completes wind tunnel test for F-22

ARNOLD AIR FORCE BASE, Tenn. — Arnold Engineering and Development Center wind tunnel testing conducted on the Air Force's F-22 Raptor aircraft in the fall satisfied requirements for later flight testing. These requirements include the successful separation of the AIM-9X missile and the 600-gallon fuel tank plus pylon.

The test was the last of eight F-22 Program office-sponsored store separation wind tunnel tests planned within the engineering manufacturing development stage, a phase conducted to ensure Air Force requirements are met or exceeded by the aircraft.

Testers used the F-22 aircraft, 600-gallon tank plus pylon and AIM-9X models, constructed at 1/15-scale, in the center's 4-foot transonic wind tunnel to acquire and evaluate data from Mach 0.4 to 1.95 at various flight conditions.

Data for the 600-gallon tank were obtained from the inboard and outboard wing weapons stations for the revised fuel states and associated store mass properties. The AIM-9X and fuel tank data will be used to prepare a mission summary for flight testing scheduled in 2003.

Additional testing, sponsored by Lockheed Martin Aeronautical Systems, the Air Force Research Laboratory and the Air Force Seek Eagle Office examined for the first time separation characteristics of the Miniaturized Munition Technology Demonstration and the Low Cost Autonomous Attack System from the Raptor.

The F-22 Raptor is in development as a replacement for the Air Force's F-15 fighter. It can travel at supersonic speeds and has a built-in ground attack capability and internal bays for air-to-air weapons.

— Reported by AEDC Public Affairs

Arizona desert home to auxillary air power

What began humbly in 1946 as one of the many Army Air Force fields designated to store post World War II reserve aircraft, has evolved into the Defense Department's sole auxiliary air power storage and regeneration facility: the Aerospace Maintenance and Regeneration Center, or AMARC.

AMARC, one of AFMC's specialized centers, has a current inventory of more than 4,600 aircraft, including assets belonging to the Air Force, Navy, Army, Marines and Coast Guard.

This vast warehouse of aircraft, located on Davis-Monthan Air Force Base, Ariz., occupies 2,600 acres of Southwest desert where low humidity and minimal rainfall conditions prevail to provide the optimum climate for preservation.

AMARC has three overlapping processes integral to this center's mission of maintenance and regeneration for sustainment of the war fighter.

"Process-in" preserves and represerves aircraft, protecting the airframe and internal components from weathering elements.

"Process-out" accommodates customer withdrawals of aircraft from desert storage and prepares them to fly. The reclamation process removes parts and assemblies from this reserve of aircraft and ships them in support of active inventory.

War fighter support

"AMARC has been in the business of supporting the war fighter since its inception," said Col. Reed Roberts, AMARC commander.

"The Korean conflict, Cold War tensions, the Vietnam War and Desert Storm have all spurred requests for aircraft and aircraft parts support from AMARC, but we routinely fill requisitions for parts and aircraft to support the services and our allies. We also provided hundreds of critical aircraft parts to support the war fighters in Bosnia and Kosovo," he said.

Last fiscal year, the services reached into this vast stockpile of fighters, cargo carriers, trainers, and utility helicopters for the regeneration of 53 aircraft.

Together, the acquisition value of these aircraft would be more than \$191 million.

Regeneration of these aircraft is performed by AMARC's multi-skilled civilian employees. These crews are trained to work on more than 69 different types of aircraft, repair or overhaul systems and modify the aircraft to current standards by meeting time compliance and technical orders, ensuring the aircraft is airworthy prior to its release.



F-16 aircraft in storage at the Aerospace Maintenance and Regeneration Center. Many of these aircraft will be withdrawn to support the U.S. foreign military sales program.

The uses of aircraft being put back into service are many and varied and represent the diverse capabilities of the workforce.

During the first year of the 21st century, AMARC responded to the Air National Guard's 109th Airlift Wing's request to withdraw two LC-130R aircraft to support the National Science Foundation research program in the Antarctic.

The AMARC work force also returned three P-3s

to the Navy for operational activities and reactivated a UH-3H for flight to Roosevelt Roads Naval Air Station in Puerto Rico.

Partnering with the other services

"We turn to AMARC to regenerate aircraft for our foreign military sales and law enforcement customers," said Mr. Tim Horn, director of the Navy's field service office at Davis-Monthan.

Last year, a partnership between AMARC and the Navy brought the successful delivery of three Navy P-3s to the U.S. Customs Department.

AMARC supports Air Combat Command's full scale aerial target program at Tyndall AFB, Fla., and Holloman AFB, N.M., and since 1972 has regenerated and successfully delivered 772 aircraft including the F-102, F-100, F-106 and F-4 for this program.

Vietnam-era F-4 aircraft are currently being flown by AMARC flight test crews to Mojave, Calif., for a contractor-installed drone package to convert the F-4 into a realistic airborne threat. The rewards of this program are highly confident, proficient, combat-trained pilots.

Today, AMARC is anticipating the withdrawal of 28 F-16s as part of the Air Force's F-16 Peacegate program.

"The Air Force will use their 14 F-16s to replace test support aircraft at Edwards AFB, Calif., and Eglin AFB, Fla., and the Navy will return their F-16s to the air as an aggressor squadron," said Maj. Mark C. Schmidt, F-16 Peacegate program manager.

Foreign military sales

The foreign military sales program is another growing customer. U.S. State Department negotiations with allies allow for withdrawal of U.S. aircraft to support a foreign government's growing operational requirements. Thai and Italian air forces have earmarked stored F-16s for future delivery.

"Supporting our allies through the foreign military sales program allows the United States to achieve the goal of weapons systems interoperability in a combined forces environment," said Mr. Patrick Mulloy, maintenance director.

In the future, AMARC will step up to meet requirements levied by a recent decision of the Air Force's A-10 system program office to regenerate 36 A-10 fighter aircraft from desert storage.

Saving time and money

Priority reclamation programs are keeping the service's active inventory flying and paying high dividends to the U.S. taxpayer. More than 18,657 reclaimed parts, valued at approximately \$170 million, were reclaimed or returned to the active inventory in fiscal year 2000 alone. During this period, AMARC's operating expense was \$51 million — "an impressive rate of return," according to Mr. Ralph Schonerman, center director.

"Parts are being removed from stored aircraft to support aircraft with a known requirement," he said.

"This is especially important during times when aircraft are involved in deployments or contingencies," he said. "AMARC can respond quickly to a need for parts when manufacturing the same part would require more lead time to produce."

Because of this center's unique ability to remove, package and ship oversized items, whole fuselage sections, center wing sections and tail assemblies have been removed and delivered. Numerous landing gear assemblies that were once part of B-52G aircraft, have been removed and shipped in support of the B-52Hs still in use.

This year, AMARC anticipates the removal and shipment of 50 nose landing gear assemblies to support the operational needs of the Air Force's T-38 pilot training aircraft.

The Navy, which stores approximately one-third of the aircraft here, relies heavily upon AMARC for fleet support.

"We could not keep our fleet flying without AMARC," said Mr. Horn. "They are critical because we cannot get the millions of dollars worth of parts anywhere else."

In January 2000, active duty A-10 aircraft began to arrive at AMARC, not for storage, but for maintenance modification. AMARC is currently installing a global positioning system enhancement on the aircraft to provide the pilot with a more precise and dependable navigational system. To date, 50 A-10 aircraft have been successfully modified and returned to duty.

Reaping the benefits

The Air Force and other training institutions are reaping the benefits of aircraft declared excess to the operational inventory. Cockpits and whole fuselages are shipped from AMARC to various destinations for use as training platforms. Luke AFB, Ariz.,

utilizes T-38 cockpits as ejection seat trainers and the Air Force Academy, Colo., uses the same type of cockpit for familiarization training. Sections as large as a C-130 nose and a C-141 fuselage are transported overland by truck for use by the services as flight simulators and loadmaster, jump and medical evacuation trainers.

The climate facilitates the outdoor storage here of more than 375,000 line items of production tooling and special test equipment for B-2, B-1B, A-10, C-5, C-141, F-4 and EA-6B aircraft. AMARC stores and effectively manages such tooling as plates, molds, jigs and dies, readily available for withdrawal by aircraft item managers to satisfy manufacturing contracts or aircraft modification. In fiscal 2000, more than 14,500 new line items arrived for desert preservation.

Storage of tooling at AMARC is an enormous savings to the taxpayer, as the cost to the government to store this tooling at a commercial facility would be in the millions of dollars.

The vitality of this center's mission and the millions of dollars in savings it represents prove it is far from being a "boneyard" or "graveyard." AMARC is a national resource which will continue to respond to the Air Force's current and future needs to keep the aging fleet operational and keep the war fighter airborne and ready to fight.

— Ms. Terry Vanden-Heuvel, AMARC Public Affairs



A reclaimed F-15 engine is prepared for shipment to an AMARC customer.

Joint service mask prototype enhances aircrew survivability in war



A device that will simultaneously provide both life support and nuclear, biological and chemical protection for all U.S. armed forces fliers has come closer to becoming a reality with the 311th Human Systems Program Office's acquisition of the joint service aircrew mask, or JSAM.

While initial JSAM production delivery is scheduled for June 2006, prototypes to be tested at Brooks Air Force Base, Texas, and elsewhere will be available by January 2002.

"This is one of the largest life support programs the SPO has been involved with," said Ms. Pat Tiner, JSAM program manager.

Awarding contracts

In July, the SPO awarded two contracts for the first phase of the acquisition, Program Definition Risk Reduction, to GEN-TEX Corporation Western Operations of Rancho Cucamonga, Calif., and Science Applications International Corporation of Abingdon, Md. These contractors are tasked with the preliminary design and systems integration.

The Air Force is the lead service for the \$330 million JSAM program that eventually will provide approximately 78,000 masks to aircrews from all services operating 116 different airborne platforms. The JSAM program was born from a military-wide need to provide multiple protection capability to aircrews.

Anti-G force protection

The Air Force, in particular, wants a mask that can provide both anti-G force protection and nuclear, biological and chemical protection. Currently, no mask being used today by American military fliers provides both types of protection within the same system.

Four key performance parameters the joint service JSAM team will help evaluate include chemical protection, biological protection, continuous protection up to 16 hours involving permeation through the material in the mask and anti-G force protection. Additionally, there are 174 other requirements, among them the issues of thermal burden and breathing resistance.

"Our preference was to develop one mask variant that would

satisfy all aircrew mission requirements, but the diversity of the operational environments will most likely result in more than one," said Mr. Chuck Hunnefeld, a JSAM team member who is a contractor with Simulations Technology Inc., responsible for mask integrated logistics.

It's not just for pilots

"This is a huge program. The mask is being developed not just for pilots, but for all aircrew members, ranging from gunners to load masters," Ms. Tiner said.

Military services prioritized their aircraft to receive JSAM and the Joint Service Integration Group analyzed and further prioritized their lists.

Following operational testing and evaluation, the new masks will be fielded based on urgency of need.

Currently, the top three priorities are Air Force Special Operations Command AC-130 aircrews, the Navy and Marine Corps' AV-8B Harrier crews and the Army's AH-64 A/D Apache attack helicopter crews.

"This program is a joint effort," Ms. Tiner said. "Although the Air Force is leading the acquisition effort, all services are represented in all working groups and decisions are made as a team."

Seven areas of evaluation

Prototypes will be tested and evaluated in seven areas, Ms. Tiner explained. Brooks is responsible for two of those areas: centrifuge and altitude chamber tests.

Lt. Gen. Robert Raggio, commander of the Aeronautical Systems Center at Wright-Patterson AFB, Ohio, is the designated acquisition commander and the milestone decision authority because of the contract's size and complexity, said Ms. Tiner.

Meanwhile, the JSAM team will continue to use acquisition reform initiatives as they refine acquisition strategy.

"We're working out the logistics requirements based on a 20-year life cycle of the program," Mr. Hunnefeld said in describing just one of the many issues the JSAM team is responsible for.

The target date for fully fielding JSAM to all users is 2011.

— Mr. Rudy Purificato, 311th HSW

AFMC "doctors" quickly and safely return damaged jets to war fighters

Returning damaged jets that might otherwise get pushed off the side of the runway to fight is the job of some 90 Air Force Materiel Command members.

These potentially pushed-aside jets are those damaged in battle, and these AFMC "doctors," of sorts are the command's aeronautical and mechanical engineers who deploy and repair that damage as part of an aircraft battle damage repair team.

Damage repair teams

Qualified engineers from an AFMC air logistics center deploy with a maintenance team from a combat logistics support squadron, or CLSS, to make up these aircraft battle damage repair teams, or ABDRs. These teams provide wartime and contingency support for Aerospace Expeditionary Force tasking and commander-in-chief operational plans, according to Capt. Josh Boatwright, ABDR program manager and lead engineer.

"These teams contain highly skilled assessors and technicians representing different aircraft maintenance disciplines," he said. "They have extensive knowledge of a specific weapon system and can also provide general assistance for other aircraft. Several teams are usually sent, depending on the scope of the conflict or exercise."

"The members provide aircraft battle damage repair teams, and engine, supply and transportation teams as well," Capt. Boatwright said. This gives the war fighting commander the necessary support to acquire and transport needed materials to sustain combat operations, as well as the engineering and maintenance support to repair heavily damaged aircraft.

"The war fighting commanders recognize that combat logistics support troops and aircraft battle damage repair team engineers provide them with a significant force multiplier," said Maj. F.X. "Buc" McRory, a Warner Robins Air Logistics

Center, Ga., lead ABDR engineer.

"During Desert Storm, we brought a virtual depot-level capability right to the flightline," he said. "We definitely had our hands full patching up structural and system damages."

On-the-spot repairs

"Deployed engineers provide the required flexibility to develop on-the-spot repairs for damages that are unpredictable or have exceeded technical order limita-

engineers are members of an air logistic center directorate and not the combat logistics support squadron."

While it's difficult to gain combat damage experience, the squadrons maintain trainer aircraft and simulate damage using shrapnel and explosives, but the amount and types of inflicted damage is limited. So, Capt. Boatwright said engineers make every effort to take part in live fire tests to observe and repair actual munitions damage to aircraft.

The Air Force formalized an ABDR program to ensure the right mix of people, material and training are available to rapidly restore mission capability to damaged aircraft. These aircraft must be repaired in time to contribute to an ongoing conflict.

"Through planning and training, it's possible to determine what types of repairs can be rapidly performed without jeopardizing the integrity of the aircraft or endangering lives," Capt. Boatwright said.

Increased costs

As the numbers of military aircraft decrease while technology and replacement costs increase, the need for aircraft battle damage repair teams multiplies. But Capt. Boatwright said AFMC is already preparing its technicians and engineers for the Air Force of the future.

"The materials and training to repair battle damage on these new, technologically advanced aircraft are already in place on a limited scale and are being expanded to include the entire ABDR community," he said.

"When it comes to combat logistics, AFMC leads the way," he said. "The combat logistics support squadrons centers provide an on-location, expanded capability to a theater commander. This guarantees the Air Force's ability to sustain combat not just on the first day, but on the continuing days afterwards."

— Tech Sgt. Carl Norman, AFMC Public Affairs



Mr. Dennis Keene, one of the initial volunteers for the civilian aircraft battle damages repair team engineering initiative at Warner Robins Air Logistic Center, Ga., conducts repairs on a C-130 outer wind assembly at the 653rd Combat Logistics Support Squadron.

tions," Capt. Boatwright said. Typically, these are military officers located in the various system program offices for the aircraft they deploy to support. They have the authority to exceed the technical order limits, waive inspection requirements and represent the aircraft's system program director for any other support needs.

In addition to having necessary education and experience, team engineers must fulfill deployment requirements, including training in small arms, nuclear, biological and chemical defense, and self-aid and buddy care. They must also participate in annual exercises in which engineers practice with their aircraft battle damage repair team.

"These exercises test their ability to survive and operate in a combat condition, as well as integrate the engineer into the team," Capt. Boatwright said. "The latter is especially important, since the

AFMC supports more than high-tech gadgets

Air Force Materiel Command's support to the war fighter means more than providing bombs, bullets and high-tech gadgets; it means allowing that war fighter to be locked and loaded when the balloon goes up.

And one way AFMC contributes is by deploying its military members to world hot spots to help keep the peace. In fact, an estimated 500 to 700 AFMC people are deployed at any given time, according to Mr. Michael Haynes, an AFMC logistics war planner. That, by the way, represents about 11 percent of the total number of Air Force people deployed during the same time frame.

This command's Aerospace Expeditionary Force contributions only represent about 36 percent of the eligible blue-suiters, according to Lt. Col. Thomas Bellnoski, chief, AFMC operations office. The Air Force chief of staff has asked all major commands to increase participation to the greatest extent possible.

"Accordingly, AFMC could be tasked to raise the number of AFMC blue-suiters to a much higher percentage, perhaps close to 90 percent over the next couple of years," Col. Bellnoski said.

In the past, deploying was often viewed as a stressful, unpredictable adventure. But, according to Gen. Michael Ryan, Air Force chief of staff, it's not that way any longer thanks to the Expeditionary Aerospace Force concept.

As members of an aerospace expeditionary force, or AEF, within the Expeditionary Aerospace Force structure people deploy to places like Saudi Arabia, Turkey, Bosnia, Kosovo and other world hot spots for about 90 days. There are 10 AEFs throughout the Air Force; under this method of operation, all major commands share the wealth in deployments rather than one or two carrying the entire load.

"It used to be that Air Combat Command took the brunt of the deployment taskings and the pains that came with them, like family and deep personal problems related to stress. Being deployed all the time was causing people to get out of the Air Force," Mr. Haynes said. "Now that the AEF has come along, people know when they'll be deployed and can have more stability in their once-unstable lives."

Military members at each AFMC base are assigned to one of the 10 AEFs. Each AEF is assigned a 15-month deployment window. They are eligible for deployment for three of those and are left alone for the remaining 12.

"The AEF schedule puts predictability into people's deployments and shares the burden more equitably," Gen. Ryan told the Air Force Association convention in Washington, D.C., Sept. 12. "The virtues of the AEF are many, but one of the great benefits

is the positive effect for our people."

"Time away on deployment — away from family, away from educational facilities, away from jobs in the case of our guard and reserve members — is tough but necessary," he said. "It's part of our duty. Mission success has its own rewards, but to make it predictable allows our people to plan their lives. We have done that with AEF. It is a success."

In December 1999, AFMC deployed members of AEFs one and two during the first three months of cycle one. Each AEF took its place in turn; AEFs nine and 10 are now deployed in the last months of the first 15-month cycle. Members of AEFs one and two will soon become eligible for deployment again as cycle two begins.

Most of the people AFMC deploys belong to support functions, according to Mr. Haynes. This includes individuals and teams in the security forces, civil engineering, air traffic control, services and other career fields as needed. Some specialized career fields like medical are involved, as well, as are combat logistics support squadrons, which perform aircraft battle damage repair.

"Our command is doing pretty well so far; we've not had any complaints from the deployment locations or major hiccups we couldn't fix," Mr. Haynes said. "We're working advance planning on the cycle three deployments so we can keep that going."

Unless unusual instances happen, such as the command's receiving a no-notice tasking, every individual tasked to deploy in an AEF should

expect to be notified about 90 to 120 days out, Col. Bellnoski said.

"That will give him or her plenty of time to prepare for the deployment, specifically to take care of family and personal concerns and plan the rest of his or her year," he said. "Our number one goal is to reduce to zero the number of AFMC people who are given very short to no-notice deployments—that's what the AEF scheduling process is all about."

And, according to Senior Airman Crystal Blunt, bioenvironmental technician, Tinker Air Force Base, Okla., that philosophy is working. Notified in August that she'd been selected as an AEF alternate to deploy to Kuwait in November, she had everything prepared in advance when she received orders, two weeks before the actual deployment.

"It's not like the old days, where you were given 24 hours notice," she said. "I had everything prepared in advance, which made my life easier. I'll actually look forward to my next deployment. It was a great experience made easier by the advance notice."

— Tech Sgt. Carl Norman, AFMC Public Affairs



Security forces can be deployed to world hot spots. (USAF photo by Mr. Bob Jensen, AFNEWS)



Above and beyond: AFRL's support to the war fighter

— Brig. Gen Paul Nielsen Commander, Air Force Research Laboratory

Some of the Air Force Research Laboratory's contributions to the war fighter transition quickly. Some can take years or even decades to mature. But in each case, the lab starts with talented men and women with innovative ideas. Those ideas can transform the Air Force — stealth, fly-by-wire, lasers, information systems, UAVs...

This year, those gems have yielded advancements across the Air Force.

While it is impossible to list all the work AFRL did this year, the following activities put perspective on the magnitude of undertakings within the laboratory.

The panoramic night vision goggle, developed by our human effectiveness directorate gained endorsement by senior Air Force leadership with a decision to field these on all USAF aircraft flying night missions.

The directed energy directorate stayed on the leading edge by developing the world's first "all-gas" chemical laser, which is more versatile than other lasers. Its 3.67-meter telescope, the largest in the Defense Department and located in Hawaii, became fully operational and the site transferred to AFRL ownership.

The air vehicles directorate maintained its edge as a member of the team that unveiled the unmanned combat air vehicle in September. Working closely on its focus areas of sustainment, unmanned air vehicles, future strike and space access, the directorate completed a successful year in collaboration with other direc-

torates, government and industry to maintain the push for new initiatives to support the war fighter.

Munitions directorate scientists and engineers demonstrated key technological capabilities to assist the war fighter. Examples included an extended range version of the joint direct attack munition, the small smart bomb and the bomb-deployed battle damage sensor.

The propulsion directorate continues innovative work under integrated high performance turbine engine technology and integrated high payoff rocket propulsion technology and began formal collaboration with the Department of Energy for cleaner fuels and emissions. Patents were issued for the directorate's microtube technology efforts with unlimited applications.

The materials and manufacturing directorate's highlights include development of multi-junction solar cells that increase the available power for spacecraft, a carbon-carbon radiator panel for efficient cooling of spacecraft and advancements in holographic polymer-dispersed liquid crystal technology that may soon allow images to be projected directly on a pilot's eye.

Space vehicles directorate people rounded out the year with such accomplishments as assisting NASA and Britain with satellite advancements of lightweight flexible solar arrays, multifunctional structure and space environmental sensors. They also added the problem-solving spacecraft technology known as MACE-II, to the international space station. From new solar cells to smart, integrated structures to lightweight apertures to TechSat 21, space vehicles continue to pioneer new space technologies.

The sensors directorate is on the lead-

ing edge of supporting the war fighter as progress is made with its targets under trees. The "Sensor Craft" vision is being used to focus and coordinate technology development efforts in several directorates, eliciting enthusiasm from customers. The sensor directorate's men and women are also reinvigorating electronic warfare science and technology and have a critical demo on-going for the Laser Infrared Flyout Experiment program.

The information directorate continued its unique partnership with New York as it broke ground in November for its new research facility. Their research with affordable moving surface target engagement, data fusion, defensive information warfare and information assurance technologies continues at a rapid pace.

And information directorate people wowed everyone at the Joint Expeditionary Force Experiment. Their command and control technologies and systems insight are in demand at Air Combat Command, Air Force Special Operations Command, Air Mobility Command, Air Force Space Command and the Aerospace Command and Control, Intelligence, Surveillance and Reconnaissance Center. Everyone wants one of the directorate's recently unveiled DataWalls.

Innovation and technology are key components of the Air Force's strong foundation. The imagination of the world's most inquiring minds — in government, in industry, in academia — is what provides the best equipment, weapon systems and ideas driving the laboratory. AFRL's scientists and engineers are ensuring that the Air Force's foundation stays strong and continues to be developed, one composite brick at a time.

Materials and manufacturing research

Providing technologies for war fighter advantage

Almost 100 years ago, Wilbur and Orville Wright defied the skeptics of powered flight to perform one of the most important feats of all time. With a flight no longer than the length of a Boeing 707's wing span, they forever changed the way we live. Every facet of our existence has been affected in some way by their "flying machine."

Perhaps no area of modern life has been affected more than our ability to defend our nation and strategic interests with air power.

Graduation from lighter-than-air observation balloons to the powered aircraft in World War I that could travel greater distances and deliver bombs changed the face of the battlefield and started a thirst for the advancement of military aviation technologies that has not been quenched to this day.

Searching for new technologies

Since 1917, men and women of Air Force Research Laboratory's Materials and Manufacturing Directorate, Wright-Patterson Air Force Base, Ohio, have been right in the middle of the search for those technologies that helped define America as a superpower and build the greatest Air Force in the world.

From the early technologies of plywood and cloth to today's advanced composite materials, war fighter support has always been a high priority for the directorate.

"The directorate has a long legacy of war fighter achievements that continues unabated today," said Dr. Charles Browning, director of the material and manufacturing directorate. "Our legacy goes back to the very early days of military aviation. As early as 1920, our predecessors began research into rubber compounds and textiles that led to more durable tires and hoses and improved parachutes, flight suits and fire-resistant fabrics.

"Through the years, they were instrumental in the use of aluminum propellers, advancements in early hydraulic fluids, plastic windshields, aluminum for aircraft structures, nondestructive evaluation and materials life prediction technologies, corrosion-resistant metals, and lightweight composite materials, and the list goes on and on," he said.

While Dr. Browning can rattle off a list of the directorate's early accomplishments like a proud father on high school graduation day, he is particularly proud of the directorate's continued support to the warfighter.

"That's what we are about," he said. "Everything we do ultimately boils down to how do we support the war fighter. It may not always appear that way because of the lead-time for the development of some materials and processes, but take my word for it — we are here to provide the warfighter of today and tomorrow with technologies that give them the advantage over every adversary."

Col. Timothy Brotherton, deputy director, couldn't agree



Aircraft technicians using the mobile automated scanner, developed through research sponsored by Air Force Research laboratory Materials and Manufacturing Directorate, check the structural integrity of a C-17 radome.

more. "While in many cases our research doesn't have immediate payoff, in just as many cases it does. We receive hundreds of requests every year for help solving materials-related problems on active weapon systems from field units and depot maintenance centers.

"Also, our collocates, assigned to most of the major weapon systems program offices, help identify materials needs on active and future systems," he said. "We are actively engaged in satisfying the war fighter needs of today and tomorrow."

Even the directorate's research planning and management process is geared to support the war fighter. Its entire research program is divided into 11 core technology areas that just about cover any kind of materials need.

Core technology research

It doesn't stop there. "Our core technology areas are aligned with one or more of five integrated application areas that focus our efforts on air vehicles, sustainment, weapons, agile combat support and space vehicles," Dr. Browning said.

"By focusing our core technology research on those integrated application areas, we can better meet the needs of today's, as well as tomorrow's, war fighter," he continued.

Meeting the needs of today's war fighter sometimes requires almost immediate solutions, as was the case during Operation Allied Force in Kosovo. Directorate engineers responded to urgent and compelling requests to provide protection technologies for forces in the region.

They responded with a rapidly deployable system that makes

use of indigenous materials to provide a high level of blast protection. They also provided six all-purpose remote transport systems in response to an urgent request from Headquarters Air Combat Command.

These remotely controlled, mini-bulldozer-type systems carry an array of tools and attachments to detect, analyze and render safe large explosive devices, as well as to clear unexploded ordnance.

Supporting systems

Besides quick response support to the war fighter engaged in real-world conflict, the directorate also provides support to meet the needs of the people and systems preparing for such a conflict.

A few of these include:

- Design of a compact power generation system for deployment to austere air fields that is 40 percent lighter than current systems and is more reliable and cheaper to operate.

- Improvement of carbon-carbon aircraft brakes that provide a 30 percent increase in braking efficiency. (See story below.)

- Development and automation of laser shock peening to increase turbine engine blade durability.

- Development of a coating material that extends life of B-1B aircraft over-wings fairing seals.

- Development of a deployable waste management system capable of reducing the volume of solid waste material at bare bases by 90 percent.

- Development of vacuum-sealed electric heating blankets for removing moisture from B-2 aircraft engine exhaust lips that reduces support equipment weight from 480 pounds to 98 and reduces installation time from two hours to 15 minutes.

- Development of a more durable protective coating that

doubles the life expectancy of maverick missile infrared sensor domes.

- Application of pre-coated fasteners to C-17 aircraft for long-term corrosion protection.

- Development and transition of a new high-temperature composite resin for more durable leading edges on F-117 aircraft.

- Development and transition of mobile automated scanning systems for field-level nondestructive evaluation of aircraft structures.

- Development of a new exterior coating for C-17 aircraft that lasts substantially longer than current exterior coatings.

Not satisfied with status quo

While the directorate's track record in supporting war fighters is well documented, Dr. Browning is not satisfied with the status quo.

"We cannot rest on our laurels. We want to provide aerospace materials and manufacturing leadership for the Air Force and the nation," he said. "That starts and ends with our support to the war fighter."

If Wilbur and Orville Wright were to somehow return from the beyond today, they would have a hard time comprehending the strides that have been made in aviation since their historic flight.

Materials research and development touches almost all aspects of those improvements.

With that in mind, the men and women of today's materials and manufacturing directorate are poised to play as key a role as their predecessors have in providing materials, processes and manufacturing technologies to the Air Force.

— Mr. Mike Griffin, Materials and Manufacturing Directorate

Technology advancements increase aircraft braking efficiency

A research effort by Air Force Research Laboratory Materials and Manufacturing Directorate, Wright-Patterson Air Force Base, Ohio, will lead to substantial improvements in aircraft brakes.

The new technology allows for cooler brake rotors, stators and surrounding wheel assembly components, while preserving other performance characteristics of conventional carbon-carbon brakes. Existing brakes can be made smaller and lighter, while maintaining an equivalent energy capacity and level of performance.

For brake designs constrained by size but requiring higher energy capacity for increased aircraft weight or landing speeds, phase-change materials will allow brakes to handle higher energy conditions than the original designs allowed.

The braking action of an aircraft during landing or taxiing involves the conversion of the vehicle's kinetic energy to

heat energy within the brakes. The heavier or faster the aircraft during landing, the more energy must be absorbed. All existing aircraft brake systems utilize the mass of the brake disks, made of steel or carbon-carbon composites, to absorb the heat associated with the braking of the aircraft.

The minimum weight of the brake is determined by capacity of material to absorb heat energy and maximum energy to be absorbed under the worst case scenario, the rejected take-off, wherein the aircraft is brought to an emergency stop prior to take-off without the advantage of thrust reverse or aerodynamic drag. Brakes and landing gear components are normally removed and replaced after a rejected take-off, adding further expense to maintenance and operations.

Directorate engineers, together with the air vehicles directorate here and Dual-Use Science and Technology program, funded a research effort to improve efficiency of brakes used on Air

Force aircraft. The result will be a reduction in the weight of the brakes, representing an enhancement of the braking capacity necessary for handling additional loads.

This led to the successful design and development of an efficient brake system that enhanced energy capacity of brake systems by incorporating a phase-change material into the brake stack design.

The Ohio Aerospace Institute, with Aircraft Braking Systems Corporation, Applied Sciences, Inc., and NASA Glenn Research Center in Cleveland, Ohio, are the primary organizations responsible for developing and demonstrating the new technology. The current brake improvement program is demonstrating a 20 percent improvement in energy capacity as the phase-change material converts from solid to liquid. The final program goal is a 30 percent increase in braking capacity.

— Reported by AFRL Materials and Manufacturing Directorate

ASC leads the way in aerospace acquisition



Aeronautical Systems Center, Wright-Patterson Air Force Base, Ohio, formed the precision attack targeting system to meet the requirement for updated targeting pods on F-16 aircraft.

Air Force Materiel Command's direct support for Air Force warriors is perhaps most easily recognized in the mission of Aeronautical System Center. The Wright-Patterson Air Force Base, Ohio, center acquires and supports aeronautical systems — including aircraft — and related equipment for the service.

Success stories

The B-1 conventional munitions upgrade program upgrades the B-1B's weapons delivery system, avionics computer complex and defensive avionics system, enabling the B-1B to accomplish future conventional missions as a critical component of the bomber force.

ASC awarded three major contracts in support of this program: a production contract to integrate cluster bomb unit delivery capability into the B-1B, an engineering and manufacturing development contract to integrate joint direct attack munition delivery and incorporate global positioning system capability, and a third contract to integrate a towed electronics countermeasures decoy.

The \$350 million F-15 active electronically scanned array radar upgrade is an aggressive, streamlined program to develop and integrate numerous high-priority capabilities into the F-15. Program activities included design, integration, test, production, fielding and sustainment.

The F-15 program team implemented several key initiatives

for this program, allowed for the team to lower costs while improving the combat capability of the aircraft.

Along with these savings, program managers completed an aggressive 10-month flight test on time, preserving the production timeline. The precision attack targeting system program was formed as part of the air combat systems program office, or SPO, to meet the Air Reserve and Air National Guard requirement for updated targeting pods on F-16 aircraft.

Industry involvement

The program office team made an early decision to maximize industry involvement in the acquisition process by capitalizing on industry expertise in technology and reduce rework of the request for proposal by including industry in its preparation.

The program office held four industry days throughout the pre-award process to ensure maximum participation and full and open information flow. Additionally, industry representatives were invited to attend critical acquisition strategy meetings to define the program and to make site visits to bases that would receive the system.

Finally, industry was afforded numerous chances to review and comment on the request for proposal before it was released. The government team — the SPO, the war fighter, the air logistics centers and the test community — conducted multiple risk assessments to refine requirements and identify critical selection criteria for competition.

So successful were these efforts that the winning contractor was invited to participate in a joint integrated product team risk assessment.

This first joint risk management workshop established action plans to manage all risks and identified risk managers responsible for implementation of action plans. These actions provided a sound basis for execution of the contract.

Acquisition reform

In 1996, the Air Force program executive officer for fighters and bombers challenged the F-22 program to apply the latest acquisition reform concepts to the development contract to field a better, faster and more cost-effective aircraft.

The F-22 system program office began by deleting more than 80 percent of the standards and specifications, then converting to a performance-based contract. This allowed increased flexibility to demonstrate aircraft test capabilities on individual aircraft.

Product support mission area

These success stories highlight some of the improvements and benefits of implementing existing acquisition reform initiatives. However, ASC is continuing to build on those successes and forging new methods, initiatives and opportunities to improve acquisition.

In 1997, Gen. George Babbitt, then-AFMC commander, set out to incorporate a framework to enhance the command's business environment.

As a result, the command established focused non-mission areas as the framework for managing the spectrum of its activities.

The Product Support Mission Area develops, acquires and supports Air Force aeronautical weapon systems.

Improving business performance

ASC has aggressively pursued the challenge of implementing and improving business performance. People in the systems management directorate applied an existing management model, value chain analysis, and prototyped it for use in the product support mission area.

This tool provides a formal structure for reviewing the center's organizations and relationships for converting resources into weapon systems.

The systems management directorate also leads the implementation of activity-based costing, allowing managers to determine the actual cost of performing the activities required to deliver products they are responsible for and more effectively manage their operations.

AFMC selected ASC to take the lead by establishing five pilot programs to test the feasibility of applying activity-based costing, now being implemented command-wide.

Cycle time reduction

In the past ten years, ASC has seen its work force reduced by 40 percent without a reduction in workload.

In April 1999, ASC launched a cycle time reduction award program to encourage innovation and increased efficiency. The center-wide goal is a 50 percent reduction in time, resources and costs expended to accomplish mission-related processes.

Candidate processes are put through a critical review based on the fundamental question, "Why are we doing this?"

If a good answer isn't found, that process will be modified or eliminated. If there is a good answer, the process is kept in place, but is analyzed to determine if it can be performed more

efficiently.

Lt. Gen. Robert Raggio, ASC commander, set aside a \$90,000 award pool as an incentive for team members. Forty-four teams from all business areas competed in the initial award period. It was regarded as a resounding success, resulting in a wide variety of significantly improved processes throughout the center.

Pre-award process

As part of the overall strategic planning process in the product support mission area, ASC is focusing attention on one of the most important business processes: the pre-award process.

This is the sequence of events for converting Air Force war fighting needs to contract awards for Defense Department contractors to deliver weapons meeting those needs.

Gen. Raggio initiated the pre-award process improvement plan to strengthen the process and introduced important changes in January of 1999.

Under this program, senior acquisition professionals in the functions, known as the senior acquisition team, or SAT, officially function as the principal acquisition advisors to the commander.

While SAT is applied at critical points in the program acquisition, a team of acquisition experts on a daily basis was also needed. All programs above \$10 million in value must now use the support and process assistance provided by the acquisition support team.

Finally, the pre-award process must include a risk-assessment phase and an early strategy and issues session for the screening of preliminary strategy alternatives and review of program issues.

In addition, an integrated solicitation review process improves quality and consistency of competitive program solicitations.

Market research center of expertise

Another area in the pre-award process that has already been used effectively is in market research.

The Air Force has launched an initiative, introduced by Ms. Darleen Druyun, deputy assistant secretary of the Air Force for acquisition and management, to dramatically increase the use of market research to better identify and assess available commercial alternatives.

Specific goals are to expand the use of commercial item solutions and practices, support price-based acquisition strategies and integrate technical, contracting and program management functions into market research.

ASC has established a market analysis and pricing center of expertise that assists program offices with information and guidance on the market research process.

To best use technical experts, the center of expertise also designated five market research center pilot programs — engines, trainer aircraft simulators, commercial aircraft and life support systems.

These initiatives and examples highlight only a few of ASC's intense efforts to reform and improve the acquisition business and are already helping programs realize benefits in schedule, cost and performance.

Existing processes will be fine-tuned, reviewed, improved and updated as necessary to accomplish the critical mission of national defense.

— Lt. Col. Kevin Rankin, ASC Acquisition

Replacement GPS satellite helps locate war fighter

Launch recognizes military veterans

Helping war fighters pinpoint their location became more reliable Nov. 10 as the NAVSTAR Global Positioning System Mission IIR-6 was successfully launched into orbit on a Delta II rocket from Cape Canaveral Air Force Station, Fla.

The satellite adds to the constellation of GPS satellites providing accurate 24-hour navigation to land, air- and sea craft, as well as missile navigation systems and aerial refueling missions.

"The 2R-6 (IIR-6) continues the success story of our recent replenishment launches to maintain the GPS constellation and support our war fighter," said Mr. Jerry Heydinger, program manager at the Space and Missile System Center, Los Angeles Air Force Base, Calif.

"Indeed, our soldiers, sailors and airmen are ever more reliant on the GPS signal to achieve their mission," he said.

A successful launch

This latest launch follows in the successful footsteps of two previous launches in 2000.

The satellite separated as expected from the booster and has operated flawlessly to date, said Mr. Heydinger. Air Force Space Command declared the satellite operational Dec. 10.

The IIR-6 is the fifth successful mission in the current block of replenishment satellites and became the 28th operational satellite in the constellation.

"These replacement spacecraft represent the continued commitment to keep the GPS system healthy for the future and for our war fighter's accuracy," said Col. Douglas Loverro, NAVSTAR GPS joint program office director.

Supporting weapon systems

This constellation supports the new and more capable weapon systems being introduced by the Defense Department that include GPS-guided air-launched bombs and missiles, which are rapidly

becoming a standard part of the war fighter's "toolbox," said Mr. Heydinger.

In addition, the Navy and Army are developing GPS precision-guided artillery shells, like the five-inch naval extended range guided munition, with the capability of hitting targets with pinpoint accuracy from more than 70 miles away.

Standoff capability

These new land, sea and air weapons provide the war fighter with significant standoff capability against adversaries, said Col. Loverro.

This allows the war fighter to engage the enemy at a reasonably safe distance.

The initial launch scheduled for Nov. 9 was postponed when closeout photos suggesting a lockwire was installed backwards on one of the two vernier engines that steer the Delta II during ascent.

"The one-day launch slip provided us the time to go out to the launch pad and properly reinstall the lockwire," said Lt. Col. Nancy Insprucker, medium launch vehicles program manager.

"Since most of our Delta II rocket hardware is already built, Lt. Col. Scott Swanson, the Delta II program manager, and his team are sharply focused on mission success," said Col. Insprucker.

"Had we launched with the lockwire installed 'as is,' one of the vernier engine's liquid oxidizer lines could have come loose during flight, and we might have lost the mission. We don't launch before it's time," she said.

Overcoming obstacles

After replacing the lockwire, the weather became the next obstacle.

"While there was a 40 percent chance of violation due to possible inclement weather, Col. Mike Baker, Mission Director and Detachment 8 commander, and the rest of the launch team thought the weather might improve as the count proceeded," said Col. Insprucker.

See GPS next page



The NAVSTAR Global Positioning System Mission IIR-6 was successfully launched into orbit Nov. 10 from Cape Canaveral Air Force Station, Fla. Air Force Space Command declared the satellite operational Dec. 10.

AFMC integrates acquisition support

A memorandum of agreement signed late last year integrates the Air Force centralized acquisition support team's, or CAST, mission into Air Force Materiel Command.

The agreement creates the acquisition support office, comprised of CAST and policy divisions, in AFMC's directorate of requirements.

Previously, the CAST function was a separate AFMC directorate.

The memorandum of agreement documents AFMC's commitment to institutionalize acquisition and logistics reform into business practices, and further defines AFMC's role in Air Force acquisition.

Logical step

In signing the MOA, Dr. Lawrence Delaney, assistant secretary of the Air Force for acquisition, and Gen. Les Lyles, commander of AFMC, took what CAST officials call the next logical step in incorporating logistics and acquisition reform into the way the Air Force does business.

"This agreement has great significance because it continues the process of institutionalizing acquisition and logistics reform and strengthens the strategic partnership between the secretary of the Air Force office of acquisition and AFMC, whose goal is to ensure affordable life cycle management of Air Force war fighting systems," Dr. Delaney said.

Essential tasks

The MOA spells out three essential tasks for the acquisition support office: identify new and innovative business concepts; translate these concepts into clear and easy-to-use processes, procedures, and training media; and institutionalize new policies into Air Force business practices.

"The acquisition support office serves a vital function in Air Force acquisition strategy," said Gen. Lyles. "These are the Air Force storm troopers for acquisition reform.

"When we created AFMC in 1992, the objective was to blend acquisition, science and technology with logistics and sustainment," he said.

"This agreement is another formal step recognizing the importance of integrating acquisition reform tools into Air Force acquisition," Gen. Lyles continued.

The acquisition support office offers acquisition reform tools to customers from across the Air Force. For example, CAST provided source selection training to Air Education and Training Command when that command was contracting out the Air

Force's national advertising campaign, according to Mr. Dan Fulmer, procurement analyst.

Expertise and advice

CAST provided expertise and advice that streamlined the request for proposal and focused the evaluation criteria on important distinguishing factors.

"In this case the CAST was able to reduce what was a 30- or 40-page statement of work into a single-page statement of objectives, plus some supporting documentation," Mr. Fulmer said.

"However, we typically get involved before the work has gone into that statement of work," he continued.

What really matters

"The approach, incorporating acquisition reform principles, is to evaluate what really matters about acquisition, such as getting the best technical solution, at an affordable price, and on schedule while refraining from putting unnecessary constraints on contractors," Mr. Fulmer said.

"We save the Air Force time and money," continued Mr. Fulmer.

The CAST division is comprised of 20 people with contracting, engineering, financial management, legal, logistics and program management expertise. Most of the people who make up the new organization were members of the former CAST.

"We still operate with a 'single face' philosophy. One person from the acquisition support office works with each customer, essentially becoming a part of that customer's extended staff," said Mr. David Franke, director of the acquisition support office.

"This change, while important in defining AFMC's role in acquisition, should be transparent to our customers," he said.

— Capt. Linda Pepin, AFMC Public Affairs



GPS - continued

"As it turned out, the weather was on our side, and we were able to launch right at the beginning of the window," she said.

Getting the satellite launched was only the beginning of the mission. Once in orbit, it underwent a series of on-orbit testing including verifying the navigation signal was stable within operational limits and that all spacecraft systems were operating correctly.

"The testing began immediately after

launch," said Mr. Heydinger.

"The first acquisition was approximately 35 minutes after launch. The solar arrays deployed on day four, the W-sensor deployed on day five, final station acquisition maneuvers began after day seven, then testing followed for several weeks until the space vehicle number was declared operational," he said.

The launch also offered a time to honor Veterans Day. This launch was dedicated to military veterans, including prisoners

of war and those missing in action.

"This was an important dedication since there simply aren't enough opportunities to show our veterans how much we appreciate them and their service," said Col. Insprucker. "This launch was an attempt to demonstrate how much today's Air Force values our veterans' contributions to our great country."

— Master Sgt. T.J. Helton, SMC Public Affairs

Edwards Air Force Base **Preparing for tomorrow by testing today**



At Edwards Air Force Base, Calif., the sun is always rising on weapons systems that will be used by future warfighters. (Photo by Mr. Kevin Robertson)

In a 2000 white paper entitled “The Aerospace Force: Defending America in the 21st century,” it’s noted that airmen have made great strides in controlling and exploiting airspace, whenever and wherever need be.

Indeed, for five decades, from the Korean War to recent Balkan operations, the Air Force has ruled the skies with air-superiority fighters ranging from the F-86 Sabre to the F-15 Eagle.

For example, as former Secretary of Defense William Perry said, “In Desert Storm, we had air dominance...that allowed our strike aircraft to devastate enemy air forces and allowed our ground forces to operate without any air interdiction. Desert Storm taught us something about air dominance. We had it, we like it, and we’re going to keep it.”

To keep it, tomorrow’s airmen will need a new air-dominant fighter: the F-22 Raptor. Furthermore, as noted in the “The Aerospace Force” and “Global Engagement: A Vision for the 21st Century Air Force,” they will need proven systems available for other tasks, whether they operate in the air or in space.

Which is why Edwards Air Force Base, Calif., continues its 50-year-old legacy of flight testing, molding next-generation aircraft today — such as the F-22, the Joint Strike Fighter, the Global Hawk Unmanned Aerial Vehicle and, the Airborne Laser System — for tomorrow’s warfighters.

Plus, Edwards increasingly supports access-to-space programs that will enable the United States to firmly own the ultimate high ground.

“We will deliver combat capability — the capacity to find, fix, assess, target and kill an enemy — which is superior to that which we have today,” said Maj. Gen. Dick Reynolds, commander of the Air Force Flight Test Center at Edwards.

Since 1947, the Air Force has evolved in and adapted to a changing world environment and to advancing technology.

Accordingly, its strategic outlook, “Global Engagement: A Vision for the 21st Century,” has an obvious air and space thread running through it.

Moreover, as spelled out in the paper, one of global engagement’s six core competencies — air and space superiority — eventually will evolve into aerospace superiority.

For future warriors, the challenge will be to establish an

appropriate level of control in space, as past and present airmen have gained in the air.

They will provide aerospace power — the use of lethal and non-lethal means to achieve strategic, operational and tactical objectives.

To retain such control, one major concern exists: rogue nations obtaining ballistic missiles. Consequently, the Air Force is developing the Airborne Laser, which is designed to destroy missiles with directed energy.

This isn’t some Buck Rogers fantasy; the ABL platform, is scheduled to begin flight tests at Edwards next year. When that occurs, practically every known aircraft will have been tested by AFFTC.

In an era of increasing competition for business, the center and its 412th Test Wing is re-engineering to ensure Edwards remains the premier test and evaluation site, that it continues probing systems destined for future use by those who aren’t even wearing the uniform yet.

“The world is changing and we have to keep pace,” said Col. Perry Lamy, 412th TW commander. What Col. Lamy wants is an organizational work force that provides a valued outcome to future “customers.”

“We say we’re proud of the F-22 program, but we don’t necessarily use the statement: ‘We’ll be ensuring clear skies for our ground troops for the next 25 years,’ which will be the result of our proving the Raptor’s capabilities,” said Col. Lamy.

This re-engineering push, Gen. Reynolds believes, will enable AFFTC to test more efficiently, more precisely, more completely and more affordably.

“War fighters should see weapons systems that finish their developmental cycle with few defects, better performance and at a lower cost,” he said. “The relevance of test and evaluation — today and tomorrow — will be guaranteed.”

Additionally, Gen. Reynolds sees partnerships with other organizations that will allow AFFTC to bring a fuller set of ground and flight test tools, and a larger skilled work force to the table.

The result: proven weapons systems delivered to tomorrow’s warfighters.

— Mr. Ray Johnson, AFFTC Public Affairs

AEDC continues role in making the future's fighter operational

The Air Force is closing in on a big day, and Arnold Engineering Development Center, Arnold Air Force Base, Tenn., is playing a key role in the countdown.

In the year 2005, the first squadron of F-22 Raptors will become operational. And just as they have for the past 10 years, AEDC's people are working with a variety of test customers to get the new fighter ready.

Last spring, AEDC personnel and a number of different test customers conducted five weapons separation tests on the F-22, ensuring these weapons would separate cleanly from the fighter in actual use.

Sharing data

The customers — the F-22 Program Office, the Joint Direct Attack Munitions Program, the Air Force Research Laboratory, Lockheed Martin and the Air Force Seek Eagle Office — each generated their own test matrix and, in some instances, shared data.

According to Test Project Engineer Doyle Veazey, the test team conducted all five tests in the center's 4-foot transonic aerodynamic wind tunnel.

Weapon separation tests

The F-22 Program Office sponsored weapons separation tests, investigated separation characteristics of the AIM-9M and the AIM-120C missiles from the F-22 Raptor.

During the test, the team acquired free-stream, aerodynamic grid, captive trajectory and captive loads data. Captive trajectory support data was acquired for the missiles from the aircraft main and side weapons bays and from the inboard and outboard rails of the outboard wing pylon station.

Captive loads data was obtained for the AIM-120C on the inboard and outboard rails of the outboard wing pylon station at four different positions down the rail.

Test conditions included Mach numbers from 0.4 to 1.95 and aircraft angles of attack from 0 to 26 degrees for an aircraft sideslip of zero.

Two weapon separation tests involving the F-22 aircraft, the GBU-32 Joint Direct Attack Munition and an F-22 pod were also executed. One test examined the separation characteristics

of the GBU-32 from the main bay of the F-22, while the other examined the separation characteristics from the inboard wing station-mounted F-22 Pod.

Tests conditions included Mach numbers from 0.3 to 1.5 and aircraft angles of attack from 1 to 15 degrees for an aircraft sideslip of zero.

Cooperative effort

The JDAM Program, a cooperative effort between the Air Force, the Navy and part of the Aeronautical Systems Center units located at Eglin AFB, Fla., sponsored the main bay GBU-32 test to evaluate the munition's most current configuration.

JDAM is a guidance kit that converts existing unguided free-fall bombs into precision guided "smart" munitions. This reduces risk to the pilot because the munitions can be dropped from the aircraft up to 15 miles from the target.

In addition to the store separation testing, the test team also performed tests to observe the flow-field characteristics of the F-22 with open weapons bays.

Lockheed Martin and the Air Force Seek Eagle Office

each funded one test and supplied their own test matrix, but shared their data.

Reducing costs

This permitted both customers to acquire a complete database without having to pay for an entire test. "With reduced budgets being the rule, it is likely that more tests will follow this pattern," Mr. Veazey said.

A three-probe rake, designed specifically for the F-22's needs in flow-field testing, was used to measure the aerodynamic pressure from oncoming wind. This allowed the acquisition of total and static pressures, Mach number and flow angularity.

The rake has three 40-degree conical pressure probes and acquires three times the amount of data of a single probe for a given test position.

Test conditions included Mach numbers from 0.7 to 1.5 and aircraft angles of attack of 2 and 6 degrees for an aircraft sideslip of zero.

— Ms. Danette Duncan, AEDC Public Affairs



A model of the F-22 being prepared for testing in the sixteen-foot transonic wind tunnel at the Arnold Engineering Development Center, Arnold Air Force Base, Tenn.

Prototype could mean more spare parts

Tinker parts reclamation process helps keep B-52s flying for another 40 years

A 40-year young bomber, the B-52H is slated to fly through 2040, and keeping it flying will be an unprecedented feat for aviation.

The recent development of a new process for harvesting aircraft parts at Tinker Air Force Base will help ensure availability of aircraft structural parts for years to come.

The proposed “surgical cut” method of aircraft elimination renders the B-52G aircraft incapable of flying and meets treaty compliance requirements, while ensuring the capability for reclamation of parts for B-52H models still flying.

Guillotine vs surgical cut

“The B-52 system program office conceived the surgical cut idea in March 1998 and presented it as a way to preserve as much airframe structure as possible,” said Mr. Al Clark, chief, airframe engineering branch of the B-52 systems engineering division.

“If B-52H aircraft are to be in the air through 2040, we need a supply of hard-to-get parts,” he said.

Because of the first Strategic Arms Reduction Treaty, signed with what was then the Soviet Union, the issue of guillotining versus surgically cutting the stored aircraft at Davis-Monthan AFB, Ariz., was raised earlier this year.

This treaty mandated that the nuclear arsenals and nuclear-capable bombers of both sides would be reduced. This meant that the B-52C, D, E and F models stored at Davis-Monthan were to be destroyed under Tinker’s guidance.

Surgical cut process

The surgical cut process uses a diamond-tipped blade similar to a large chain saw to dissect the aircraft into parts set on wooden stands. “The stands support the aircraft before and after the surgical cut has been made,” said Mr. Clark.

“The resulting aircraft sections are then sealed to protect them from animals and the weather. We harvest wing sections, horizontal and vertical tail surfaces, fuel pumps and a myriad of other parts,” he said.



A lead test mechanic at AEDC’s Aeropropulsion Systems Test Facility discusses testing of the TF33 engine with a KC-135E pilot for the Alaska Air National Guard’s 168th Air Refueling Wing at Eielson AFB, Alaska. This test was conducted in 1995 to baseline the engine’s cold-weather starting capability and range performance with the then new JP-8 jet fuel. The TF33 is used on the B-52H, C-141 and many of the C/KC-135 models. The test was performed for the Oklahoma City Air Logistics Center at Tinker AFB, Okla.

Prior to Tinker’s development of this method, a guillotine method was used. This rendered the aircraft not only inoperable, but also destroyed any future parts reclamation when a three-ton blade was dropped in guillotine fashion.

Imaging and inspection

Even though the surgical cut prototype proved this method valuable, its cost of approximately \$73,000 per aircraft raised a question of funding.

“Guillotining only costs about \$3,000, but there’s no opportunity to harvest needed parts,” said Mr. Clark.

“In the long term, our surgical cut method will save at least \$7 million dollars per aircraft in parts reclamation. The cut process has been approved, but now we’re trying to raise the funding to move forward.”

In addition to developing a new process to save parts, the B-52 systems engineering division uses the Aerospace Maintenance and Regeneration Center at Davis-Monthan as an engineering lab, which allows Tinker to be more proactive on the aircraft during the programmed depot maintenance.

“We’ve tried out new equipment such as the magnetic optical imaging

unit used to detect stress cracks in the aircraft skin and included the skin replacement in our programmed depot maintenance process,” Mr. Clark said.

“We also found that there was a build-up of corrosion on a section of the cockpit window frame due to a water leakage from the escape hatch,” he continued. “We added 10 aircraft to the analytical condition inspection of the programmed depot maintenance process line to see if we had this same type of corrosion in the H model.

“When they did the inspection, they discovered we did have a problem. As a result, we now automatically go in and add drain holes so we don’t develop this type of corrosion in the future.”

Parts in the bank

To date, the funding has been found to perform the surgical cut on eight more aircraft, but time is running out.

Of the 96 B-52s at Davis-Monthan, Tinker is responsible for the destruction of 45 more by December.

“If the funding efforts are successful and the surgical cut process proceeds, a wealth of needed parts will be in the bank waiting for the B-52s still in the air today,” Mr. Clark said.

— Ms. Gail Kulhavy, OC-ALC Public Affairs

After it's first flight on Dec. 23, 1941, the C-47 Skytrain operated from every continent in the world and participated in every major WWII battle. Today, the C-47 is still being used in countries such as Argentina, Zaire and Columbia. AFSAC is responsible for sustaining the aircraft for those countries.



First flying Dec. 23, 1941, the C-47 Skytrain operated from every continent in the world and participated in every major battle of World War II. Gen. Dwight D. Eisenhower, supreme commander of Allied forces in Europe, said it was "one of the most vital pieces of military equipment used in winning the war."

Today, the C-47 is still being used in countries such as Argentina, Zaire, South Africa and Columbia. Air Force Security Assistance Center, or AFSAC, sustains that aging aircraft and others like it around the world.

"We have a number of partners and allies who use our equipment," said Maj. Gen. Claude Bolton, AFSAC commander. "We sell them equipment, such as aircraft and services, then we sustain them. We are their brokers."

AFSAC, located at Wright-Patterson Air Force Base, Ohio, has over 83 foreign military sales, or FMS, customers. Combined, the countries have about 9,000 aircraft ranging from the vintage C-47 to the modern Boeing 767 AWACS.

As planes get older, it's harder to maintain them. That's where Lear Siegler Logistics International, Inc., an AFSAC contractor, steps in under the parts and repair ordering system, or PROS, program.

If a country needs a part for its aircraft, it makes the request through a letter of acceptance, which then becomes a case. If the part is standard, meaning it has a national stock number, the request is either forwarded to the responsible air logistics center or Defense Logistics Agency. If it's non-standard or non-supportable, the request is transferred to a contractor, which uses PROS to search for a qualified company that has the item, or is willing to make it.

Mr. Don Hoyle, chief, supply performance and analysis branch and previous PROS program manager, said that 93 percent of the PROS workload comes from non-standard items. "We have been maintaining aging aircraft for foreign customers for almost 20 years," said Gen. Bolton, "We have a data base with more than 6,000 vendors who provide goods and services that keep these aircraft flying."

AFSAC can get involved in any system sold overseas by the Air Force. For example, Great Britain is interested in the Joint

Strike Fighter and ultimately, the Air Force could sell several to them. Then it will be AFSAC's job to maintain the logistics supply support and repair services for those aircraft.

It's not just getting the customers the parts or services that is important; there is a large emphasis in the quality. "We have promised our customers the quality they receive will be equal to, or better than, what the U.S. Air Force has," said Mr. Hoyle.

"Right now, PROS has a supply discrepancy report of 0.54 percent," he said. "That is an impressive number, especially when you want to keep it below 1 percent. It is a benchmark we use to ensure our customers are getting the best quality."

With a budget of \$25.8 million, AFSAC generates \$2.5 billion every year. Of the \$25.8 million, 99 percent of that comes from foreign military sales money.

"I went out and talked to a consultant to see if they were interested in PROS, and how much they would charge for a management fee," said Gen. Bolton. "This person, who works for an international consulting firm, said they would start at about 7 percent, but most likely 10 percent. Considering our 1 percent management fee, there is a bargain in what we do here."

In addition, the Air Force is finding it more difficult to maintain its aging fleet. "On a number of cases I have had calls from logistics centers asking if they can use our services," said Mr. Hoyle. "As long as we could establish a funding source and priority, we have been able to help. There is no reason why this program could not be used to support U.S. aging aircraft. It seems to make sense, in fact, because we already have a large base of identified resources out there for aging aircraft support."

AFSAC is also moving into space. Gen. Bolton, as part of a steering group, is gathering space policy and positions, exploring how, through international cooperative agreements, AFSAC can use and fund Air Force technical and real property assets.

As space vehicles age, they will also require sustainment and AFSAC will be there to help as it has for its customers the last 20 years. "The better we do our job here, providing support," said Gen. Bolton, "the better our customers are able to do their job in coalition warfare. AFSAC will be with them on the ground, in the air and, ultimately, in space."

— Capt. C.K. Keegan, AFSAC Commanders Action Group



AFMC commander launches Year of Family

WRIGHT-PATTERSON AIR FORCE BASE, Ohio — Gen. Les Lyles has realigned the command's Year of the Family celebration to the calendar year versus the fiscal year.

The year-long celebration kicked off in January, said Ms. Niki Foor, AFMC's family matters chief. Gen. Lyles launched the celebration with one of the first major events — a Dr. Martin Luther King luncheon Jan. 18.

Gen. Lyles signed a proclamation Jan. 9 making 2001 AFMC's Year of the Family.

"The YOFAM vision is to demonstrate leadership's interest and involvement in quality of life, and to improve the marketing of programs and activities already in existence," said Ms. Foor. "We have developed quarterly themes using desirable community results as categories to help us reach these goals. These themes will help base organizations and agencies focus on activities and publicity that improves awareness and utilization of current programs."

Other areas YOFAM will address include safety, health and well being, family adaptation, community satisfaction and personal preparedness.

"We have provided an overview of the program and a game plan, and we pledge to address AFMC-wide community concerns at the headquarters level, but the success of YOFAM rests with you," Gen. Lyles said. "Many, if not most, quality of life issues are local ones; your committed involvement in improving the quality of life at the local level is crucial to this effort. I truly believe that together, we can make a difference."

— Reported by AFMC Public Affairs

Edwards re-engineering rolls as ROC takes place

EDWARDS AIR FORCE BASE, Calif.

— As part of an overall re-engineering project, the 412th Test Wing at Edwards took the first step towards realigning itself around business processes instead of employee skills with the activation of the Resource Operation Center, known as ROC, in January. ROC will oversee the scheduling of flight test resources such as aircraft, maintenance, range assets and telemetry.

Twenty-four cross-trained, multi-skilled members at a single location in the 412th Operations Group now perform numerous duties previously managed by 43 people in three different organizations. The co-location alone has greatly improved both communication and conflict resolution.

"Before ROC, if anything went wrong with a particular plane on the day of a planned flight, it could quickly spiral into a crisis management situation with people not being able to reach each other," said Col. Dwight Engle, commander of the 412th Logistics Group. "Placing them under one roof and under the control of one entity can minimize such dilemmas."

Mr. Dennis Hines, project manager for the wing, explained that the concept of organizing around functions — or skills — dates back to the Industrial Revolution when workers in factories were taught one skill, but didn't understand how they fit into the overall manufacturing process. The 412th Test Wing is steadily moving away from such notions and gravitating toward a view where "people are assigned to a whole process and train them on the whole process — not just their piece of it."

— Reported by AFFTC Public Affairs

Air Force Museum offers "Behind the Scenes" tours

WRIGHT-PATTERSON AFB, Ohio — A popular attraction designed to grant individuals a more intimate view of ongoing exhibit design, restoration and collections management efforts at the Air Force Museum is open for registration.

"Behind the Scenes" tours will take visitors to hangars on the historic Wright Field flight line to see a variety of aircraft in varying stages of the restoration process, learn of some of the techniques used

in exhibit construction and learn about collections management processes.

Individuals must register for the tours, scheduled for February 9, March 9, April 13 and May 11. Limited to 40 participants each, the tours are free.

To make tour reservations or to gain more information, call the museum at (937) 255-3286, ext. 302.

The U.S. Air Force Museum is located on Springfield Pike, six miles northeast of downtown Dayton. Admission and parking are free.

— Information provided by U.S. Air Force Museum Public Affairs

AFRL consolidates test facilities at WPAFB

WRIGHT-PATTERSON AIR FORCE BASE, Ohio — Two existing test facilities here are being combined and updated to create a new consolidated aerospace structures research laboratory, adding space and capability to research efforts.

Butt Construction of Dayton is making the modifications necessary to relocate two separate buildings under one roof, said Mr. Ken Leger, lead project engineer in the air vehicles directorate structures division. This is part of an \$18 million Army Corps of Engineers military construction contract awarded last fall.

"The new lab, scheduled for completion by winter 2002, will permit simultaneous flight load, heat and acoustic tests for aerospace structures as large as 10 feet by 10 feet, versus the previous, 4-by-4-foot structural limit," said Mr. Leger.

— Reported by ASC Public Affairs

Robins exceeds goal for competitive contracts

ROBINS AIR FORCE BASE, Ga. — For the ninth consecutive year, Warner Robins Air Logistics Center exceeded its yearly goal for signing competitive contracts, said Mr. James Grant, director of contract policy and competition advocate division, contracting directorate.

Robins' goal was set at 41 percent competitive contracts as a proportion of total contracts. It ended the year with 42 percent worth a total of \$822 million.

The Air Force establishes the yearly competition goals for each center to promote full and open competition among vendors for federal contracts.

— Reported by WR-ALC Public Affairs

TPS students evaluate design tool



As part of a test management phase for the curriculum at the U.S. Air Force Test Pilot School, Edwards Air Force Base, Calif., six students evaluated a new handling qualities design tool that could help prevent pilot-induced oscillations in future aircraft.

The student test team examined equipment known as the open-loop onset point criterion, which was developed by German Aerospace.

It is designed to help engineers better predict the likelihood of pilot-induced oscillations, which is a swinging movement, when rate limiting — aircraft control surfaces operating at their maximum capacity — occurs.

Rate limiting on aircraft with a highly augmented flight control system could

lead to pilot-induced oscillations and the potential loss of both aircraft and pilot.

The F-22 Raptor and the Swedish JAS-39 Gripen are both highly augmented aircraft that have experienced severe pilot-induced oscillations in which rate limiting was considered a major factor.

In conducting their tests, the team used one of the school's newly acquired assets, the NF-16D variable stability in-flight simulator, also known as VISTA.

The test team programmed several flight control configurations into the VISTA simulation system, with each configuration containing a control surface with rate limit characteristics that could be changed in flight.

The student test pilots flew each configuration and evaluated their pilot-induced oscillations susceptibility under

the effects of rate limiting. Flight test results then were compared to open-loop onset point criterion predictions.

This class project had a two-fold benefit for one participant. Capt. Greg Gilbreath, open-loop onset point project manager, not only is a test pilot school student but also part of the joint Test Pilot School/Air Force Institute of Technology program that allows him to conduct flight testing in support of a thesis on open-loop onset point.

Besides Capt. Gilbreath, the team included student test pilots Capt. Scott Ormsby, Capt. Luciano Ippoliti of the Italian Air Force and student flight test engineers Capt. Mike Meyer, Capt. Shaun Hick and 1st Lt. Marco Latela, also with the Italian Air Force.

— Mr. Ray Johnson, AFFTC Public Affairs

ESC delivers ninth Joint STARS aircraft early

Electronic Systems Center, Hanscom Air Force Base, Mass., delivered the ninth E-8C Joint Surveillance Target Attack Radar System production aircraft to Robins AFB, Ga., Dec. 19, seven weeks ahead of schedule. The aircraft, better known as Joint STARS, was delivered to the 93rd Air Control Wing.

"A tremendous team effort resulted in delivering a plane the wing will be able to add to its flying inventory almost immediately," said Col. Gary Connor, Joint STARS joint program office director.

A cooperative effort among prime contractor Northrop Grumman, the joint program office and wing focused on delivering the aircraft in ready-to-go status.

The team, with the on-site defense contract management people, completed the government's contractual inspection and a large percentage of the acceptance inspection simultaneously, allowing the aircraft to be placed on the active flying schedule much quicker.

Joint STARS is the world's most advanced airborne surveillance and target acquisition system. It provides real-time, accurate information on surface targets and slow-moving aircraft to air, land and naval forces. A proven battle management force multiplier, it ensures U.S. and coalition forces can preserve peace, control crises and win wars, said Col. Connor.

— Reported by ESC Public Affairs

KC-10 tanker refuels X-32A JSF



Above: A Boeing X-32A Joint Strike Fighter flies behind a KC-10 Extender during a flight test Dec. 14 at Edwards Air Force Base, Calif. The series of X-32A aerial-refueling tests culminated Dec. 19 when, for the first time, the KC-10 successfully transferred fuel to the X-32A. Below: Flying at 20,000 feet and more than 270 mph, Cmdr. Phil Yates pulls the X-32A JSF in behind a KC-10 tanker during the Dec. 19 mission. As part of a five-month test program at Edwards, the X-32A will complete nearly 60 flights totaling more than 75 hours to validate the JSF's predicted flying characteristics. (Photos by Capt. Tom Crosson, AFFTC)

The Joint Strike Fighter program reached a significant milestone Dec. 19 when a KC-10 from Travis Air Force Base, Calif., performed the first aerial refueling of Boeing's X-32A concept demonstrator.

The Travis crew, part of the 6th Air Refueling Squadron joined members from the 418th Flight Test Squadron at Edwards AFB, Calif., for the X-32A's 40th sortie since beginning a five-month test period at Edwards. The mission involved three contacts between the X-32A and the KC-10.

Because the X-32A is the Navy's JSF version, the KC-10 was required to refuel it with a drogue and probe. This required X-32A lead test pilot Cmdr. Phil Yates to maneuver the fighter's refueling probe to a basket receptacle that flies freely behind the tanker. Even though probe and drogue refueling is primarily performed on Navy aircraft by C-130s, Cmdr. Yates said the KC-10 was the best choice for this mission.

"The KC-10 is a more stable platform as opposed to the C-130 and is more flexible," he said. "Plus, the 'J' in JSF means joint. The ability to be refueled by multiple aircraft from different services increases the JSF's efficiency."

While aerial refueling will be inherent to the JSF, this test mission fulfilled some of the program's short-term goals: give the X-32A greater test flexibility, increase the aircraft's test efficiency and to see if the KC-10 can accompany — or drag — the X-32A on its cross-country flight to Naval Air Station Patuxent River, Md., early next year for its next series of tests.

Before the flight, Cmdr. Yates noted this mission was not treated as an average air-refueling sortie. "I have not been this concerned about an X-32A flight since its first flight. The pilot has a lot of control inputs to get the jet hooked up. The boom operator can't guide the aircraft in like in boom refueling."

A small array of air data instruments on the aircraft's nose added a level of difficulty to the flight. With only 18 inches of clearance between the aircraft's nose and the tanker's basket once it is connected, an unsuccessful attempt to dock with the KC-10 could knock the basket around and damage the aircraft.

The commander for the refueling said his crew was pleased when they received news they would be making this test flight.

"It's an honor to be a footnote in the X-32A and JSF program's developmental history," said Lt. Col. Dan Favorite, mission commander from the 6th ARS.

The X-32 is one of two JSF concept demonstrators — the other being Lockheed Martin's X-35, undergoing tests here. The JSF program, which began in 1996, uses a unique approach to provide a highly affordable, mission-effective solution to the tactical aviation needs of the Air Force, Navy, Marine Corps and United Kingdom Royal Navy and Royal Air Force.

The JSF is meant to replace the aging F-16 Fighting Falcon, the A-10 Thunderbolt II, the AV-8B Harrier and the F/A 18 Hornet. The Department of Defense is looking to establish commonality and modularity between different JSF models, to demonstrate the short takeoff and vertical landing capabilities of the Marine Corps and British versions, and to demonstrate low-speed and handling qualities of aircraft carrier approaches for the Navy version.

— Capt. Tom Crosson, 60th Air Mobility Wing Public Affairs

Last EC-135E ARIA

Retired to Air Force Museum

An old adage that tells us "You can never go home." Another one says the opposite: "There's no place like home."

For the sole remaining EC-135E Advanced Range Instrumentation Aircraft, or ARIA, and the crew who flew her last flight Nov. 2, it is the latter that rings true.

Relocation

A team from 452nd and 418th Flight Test Squadrons and 450th Test Squadron from Edwards Air Force Base, Calif., delivered ARIA No. 374 — nicknamed the Bird of Prey — to the Air Force Museum at Wright-Patterson AFB, Ohio, after a four-hour flight.

Also on board were a handful of airmen who once operated and maintained a small, unique program of airborne telemetry platforms that is being retired due to costs and satellite technology improvements.

The final flight

Included on this final sortie were Lt. Gen. Robert Raggio, commander of Aeronautical Systems Center at Wright-Patterson and Maj. Gen. Dick Reynolds, Edwards Air Force Flight Test Center commander.

During the late 1980s, both men commanded ARIA units that traveled worldwide to gather data during spacecraft launches and missile tests.

Gen. Raggio and Gen. Reynolds both flew No. 374, which is easily recognizable by a bulbous nose that houses a 7-foot dish antenna.

Bittersweet experience

Gen. Raggio remarked that participating in 374's homecoming was a bitter-

sweet experience.

"Of course, we are all sad that the aircraft will not be used anymore," he said.

"However, the close-knit ARIA community is very pleased that it rests at the museum for all for us to visit and reminisce of missions past."



Gen. Reynolds called the aircraft's retirement the end of a long history of important developmental and operational test efforts vital to the United States and its allies.

"The ARIA belongs in the Air Force Museum because of the crucial role it played in advancing aerospace technology," he said.

Developed by NASA

Originally named Apollo Range Instrumentation Aircraft, the ARIA was developed by NASA and the Defense Department in the 1960s to track lunar missions, along with unmanned orbital and ballistic re-entry programs.

The first of eight EC-135N's became operational in 1968 as the program stood up at Patrick AFB, Fla.

Seven years later, ARIA, redesignated

the Advanced Range Instrumentation Aircraft, transferred to the 4950th Test Wing at Wright-Patterson.

To the ends of the earth

It was there, from 1987 to 1989, that Gen. Reynolds commanded the 452nd Test Squadron, which made ARIA

deployments to the far corners of the globe.

Some places ARIA visited: Pago Pago, New Zealand, Barbados, Fiji, Greece, Argentina, Singapore and Senegal, just to name a few.

It was during a trip to Barbados that Gen. Reynolds remembers his favorite mission.

Light show

Supporting a Trident submarine test, the general recalls flying in the middle of the

Atlantic Ocean on a moonless night when 10 missile re-entry vehicles rained in ahead of his aircraft.

"It was a spectacular light show — picture perfect," he said.

Capt. Chip Bulger, mission commander for Bird of Prey's last flight, said his favorite ARIA trip was in support of the Defense Meteorological Satellite Program, and was the last three-ship operation for the 452nd Flight Test Squadron.

It was the immense undertaking's difficulty that made it so memorable, the captain said.

It was challenging

Planning was challenging due to multiple last-minute customer changes and executing the mission was made even tougher because 18 squadron operators

Continues as ARIA on page 24

ARIA continued from page 23

were sick from the flu.

Plus, the mission-support point was completely obscured by sudden intense thunderstorms that forced last-minute replanning during, what Capt. Bulger called a “bumpy” ride.

“It took every person assigned to ARIA to accomplish the mission,” said Capt. Bulger, who flew on No. 374 just north of the equator during the trip.

“It was definitely a highlight of my years in the Air Force,” continued Capt. Bulger.

Every journey was special

For Master Sgt. John Nakos, an ARIA communications operator, every journey was special for one reason or another.

“Every trip was memorable,” said Sgt. Nakos, who flew nearly 60 missions on the Bird of Prey and has more than 2,800 ARIA flight hours.

“That was because of the type of job, the locations that we were staging from and, most importantly, the people we worked with,” said Sgt. Nakos.

Relocated

In 1994 the ARIA program, which now included EC-18B aircraft and more than 200 airmen, relocated to Edwards in California.

Gradually, taskings dwindled with planes being declared excess and transferred to other programs such as J-STARS. Today, only about 75 people directly and indirectly support the existing mission.

With No. 374 now sitting at Wright-Patterson, only two active EC-18B's, which are being used primarily by the Navy for pilot training, represent ARIA's 30-year history.

Coming home

However, that will change next May when the returned EC-135E will be officially displayed at the Air Force Museum during a ceremony that will honor 21 ARIA crewmembers killed in a 1981 accident.

Expected to be present are hundreds of No. 374 crewmembers who flew many of the roughly 300 missions the Bird of Prey made to support launches for high-profile programs such as the space shuttle, deep space probes and Mars Path Finder.

And for those attending, they — like No. 374 — are once again coming home.

— Mr. Ray Johnson, AFFTC Public Affairs



Maj. Gen. Dennis Haines, Warner Robins Air Logistics Center commander, lists points discussed during a luncheon meeting in December to plan base-wide activities for AFMC's Year of the Family. (Photo by Ms. Sue Sapp, WR-ALC Public Affairs)

Year of the Family 2001

When you care enough to provide the very best

According to the 1999-2000 Air Force Community Needs Assessment survey, most military members at Robins Air Force Base, Ga., are satisfied with family support services. However, deployed members don't feel community support as strongly as others, said Ms. Christine Parker, family support services director.

Correcting that gap was a key part of the discussion late last year by about 30 commanders, enlisted leaders, directors and members of the family support network at Robins.

The purpose of the meeting was to plan base-wide activities in accordance with Air Force Materiel Command's Year of the Family 2001. Maj. Gen. Dennis G. Haines, Warner Robins Air Logistics Center commander, asked the question, “What are the kinds of things we can do that tell people we care?”

He suggested that CARE could be an acronym for concern, action, respect and enrichment as part of a Robins logo for the campaign, dubbed YOFAM 2001.

“Being at Robins has been the best assignment I ever had, but we can do more to make life better for families,” he said. “I want to get your input on how to proceed from an organizational standpoint. We have the family support center, but we want to bring more of our community into the process.”

Ms. Parker presented a briefing on quality-of-life activities and services on base, first citing the Air Force survey that began in the fall of 1999, which asked standardized questions regarding family advocacy, youth and child services, health and wellness and family opportunities.

“For the most part the population at Robins have their needs met, but there are people out there who are not aware of what's available,” she said.

“A community action information board, chaired by Col. Jay Seward, 78th Air Base Wing commander, serves as a cross-functional forum to address quality-of-life and community issues,” she said.

“Family Services alone can't reach the variety of groups and agencies on base,” she said. “It's not a family services thing, it's a community thing.”

Suggestions included: making it easier for families stationed at Robins with deployed members, “first school day celebration” for parents and children and developing flyers and interactive kiosks with computer displays in heavily-trafficked areas.

— Mr. Hal McKenzie, WR-ALC Public Affairs

Young gridiron star's memory honored

All young Charles "Moose" Dickinson III ever wanted to do in life was break tackles to score touchdowns and draw pictures of God as he contemplated eternity.

While his life and dreams were cut short at 14 when a drunk driver killed him earlier this year, his memory lives on at Brooks Air Force Base, Texas, as the only athlete to ever have his number retired.

Brig. Gen. Lloyd Dodd, 311th Human Systems Wing commander, presented a framed No. 48 jersey to his parents, Mr. and Mrs. Charles Dickinson, at halftime ceremonies during the Brooks Eagles junior football team's homecoming game in October. In 1996 Moose helped lead the Eagles to their only Texas Youth Football Association state championship.

The first-of-its-kind ceremony was the inspiration of the boy's Brooks coach Mr. Ray Lopez and Brooks Youth Sports director Mr. Larry Flores, whose stepson Ernesto suggested that the base retire the boy's number.

A team player

"He was an important part of that championship team," Mr. Flores said of Moose who played for the Eagles during the 1994-1996 seasons.

His parents appeared emotionally overwhelmed by the ceremony in which Gen. Dodd highlighted their son's contributions to Brooks sports. "Most of my memories of his success in sports are at Brooks," said his father, who

was an assistant coach for the championship team.

Award winning player

While his son had developed a reputation as a great offensive player, his defensive

rough kid. Football attracted him because he loved to "bang heads," his father said.

"Chuck was quick for his size," he continued. "At 8 years old he weighed 123



Mr. and Mrs. Charles Dickinson hold their son's retired jersey that Brig. Gen. Lloyd Dodd presented to them at the Brooks Eagles junior football team homecoming game in October. (Photo by Mr. Rudy Purificato, 311th HSW)

prowess helped the team to an undefeated season and earned him the "Defensive Player of the Year" award. During the state championship game, it was his defense that dealt a crippling blow to their opponent.

The 6-foot-plus, 257-pound linebacker cut off a potential game-tying touchdown run when he executed a perfect game-ending block, his father recalled.

He loved football

Nicknamed Moose by his mother because he wore Dallas Cowboys linebacker "Moose" Johnson's number, the youth's passion was football.

"He was a typical boy, a

pounds. He was too big to play Pop Warner football. He played at Brooks because there is no weight limit."

A giant among boys

His mother knew when her son weighed in at 10 pounds at birth that he'd become a giant among boys.

"He was very strong and fast," she said. "When he was 4 years old he picked my mother up off the ground."

Moose initially played both offensive and defensive tackle and nose guard during his inaugural season with the Eagles. He eventually became the team's first-string fullback, gaining a reputation as a powerful, nearly unstoppable ball carrier.

The Moose is loose

His fame grew as the team's unofficial slogan "Look out, the Moose is loose" plastered on boosters' vehicles helped intimidate the opposition.

"He just barreled through guys, often hauling with him four or five players," his father said. Several times his speed led to 60-70 yard touchdown runs. "Once he broke free, nobody could catch him."

Texas high school coaches noticed the boy's talent and potential during the 1996 playoffs. "We talked about a football career and the possibility of his earning a college scholarship," his father said. Moose opted to play the 1997 season for his hometown La Vernia Junior High School where he helped lead the Bears to an undefeated season.

He was looking forward to playing high school football this fall when tragedy struck. "He spent the night at a friend's house," his father said. "At 6:30 a.m., April 15 he was walking home along the shoulder of Highway 87 when he was hit by a drunk driver." He was killed instantly.

The Dickinsons expressed their appreciation to Gen. Dodd, Mr. Flores and Mr. Lopez for their support and dedication in promoting Brooks youth football.

"We were ecstatic and very touched by the ceremony," Mr. Dickerson said. "It showed us that the Brooks community loved Chuck like we loved Chuck."

— Mr. Rudy Purificato, 311th HSW



Col. J. Douglas Beason

AFRL colonel becomes a Physical Society Fellow

KIRTLAND AIR FORCE BASE, N.M. — The American Physical Society has elected Col. J. Douglas Beason here to become a fellow in the society.

Col. Beason, Phillips Research Site commander and the deputy director of the Air Force Research Laboratory's Directed Energy Directorate, will be awarded the honor during the society's March meeting in Seattle, Wash.

Only one-half of one percent of the society's more than 40,000 members are selected annually for the rank of fellow, the highest title within the society.

Col. Beason's election to American Physical Society fellowship is considered peer recognition for his outstanding contributions to physics.

In his role as commander of the Phillips Research Site, Col. Beason oversees 1,900 government and contractor employees.

As the deputy director for the laboratory's directed energy directorate, he is responsible for advancing all Air Force science and technology in lasers, high-power microwaves and other directed energy activities.

In a previous assignment, Col. Beason served as an adjunct to the National Space Council, working for the president's sci-

ence advisor at the White House Science Office under the Bush and Clinton administrations. There, he was the key White House staff officer for aeronautics, space science and technology at the Department of Defense, Department of Energy and National Aeronautics and Space Administration.

A U.S. Air Force Academy graduate with a doctorate in physics from the University of New Mexico, Col. Beason is the author of more than 50 scientific and technical papers.

His book on defense science and technology policy is currently being used as a textbook.

— *Reported by Mr. Rich Garcia, AFRL Public Affairs*

AFRL team wins super computing 2000 award

ROME, N.Y. — A six-member team from the Air Force Research Laboratory's Information Directorate captured two of four awards presented at last month's Super Computing 2000 High Performance Computing, or HPC, Games Challenge sponsored by the Institute of Electrical and Electronics Engineers.

The HPC challenge for Super Computing 2000 was to build the fastest supercomputer possible for \$10,000 or less. Entries were judged on more than 60 standard computer benchmarks, measuring performance of single-processor computation, memory systems, communications and parallel computation.

Four teams were entered in the 15-hour competition: the Red Team from the directorate's information technology division; the Aggregate Team from the University of Kentucky; the Black Lab Linux Team from CSPI Inc.; and the MITRE Team from MITRE Corp. of Bedford Mass.

Red Team members included Mr. James Hanna, 1st Lt. Peter Hsieh, Mr. Robert Hillman, Mr. Zenon Pryk, Mr. Wilmar Sifre and Mr. Walter Koziarz.

They built and operated the computational cluster of commodity processors entry to the HPC Challenge.

The efforts and expertise won team members the competition's grand prize and the "most innovative software prize."

Mr. Gordon Bell, a senior researcher at Microsoft Corp. and philanthropist, sponsored the awards.

— *Reported by Mr. Francis Crumb, AFRL Public Affairs*

Rome scientist named Engineering Fellow

ROME, N.Y. — Dr. Richard W. Linderman, special advisor to the chief scientist at the Air Force Research Laboratory's Information Directorate, has been elected as a Fellow of the Institute of Electrical and Electronics Engineers, or IEEE.

Only one-tenth of one percent of the Institute's international membership of nearly 275,000 can be elevated to the status of fellow in a given year. The honor is bestowed after a review of nominations outlining a member's lengthy professional contributions.

The institute specifically cited Dr. Linderman for contributions to the design of embedded high-performance computing technology and its use in aerospace signal and image processing systems.

Dr. Linderman, a resident of Rome, joined the staff of the former Rome Air Development Center in 1988, after serving four years as assistant professor in the Electrical and Computer Engineering Department of the Air Force Institute of Technology, Wright-Patterson Air Force Base, Ohio.

He was selected as an Air Force Research Laboratory Fellow in 1999 and was named recipient of the Federal Laboratory Consortium's award for excellence in technology transfer in both 1994 and 1995.

He was a founding member of the IEEE Mohawk Valley Section Signal Processing Chapter in 1991, serving as vice chairman from 1991 to 1996. He has been chairman of the chapter since 1996.

In his current position, which he assumed in 1999, Dr. Linderman is responsible for the organization, planning and advocacy of signal processing technology across the Air Force Research Laboratory, representing an annual investment of approximately \$42 million.

— *Information reported by Mr. Francis Crumb, AFRL Public Affairs*

Top honors from Sweden for Brooks scientist

BROOKS AIR FORCE BASE, Texas — Dr. Ulf Balldin was recently honored with two prestigious Swedish awards for his work at Brooks involving aviation medicine research and G-force protection for fighter pilots.

A Wyle Laboratories, Inc. aerospace medicine senior scientist who supports the Air Force Research Laboratory Human Effectiveness Directorate's Biodynamics and Protection Division, Dr. Balldin was recognized for his work primarily conducted at Brooks since 1992 under a memorandum of agreement between the U.S. and Swedish Departments of Defense.

His acceleration physiology research focused on G-force protection that led to the development and testing of new anti-G suits for fighter pilots for both the U.S. and Swedish air force.

In November, Dr. Balldin received the Royal Swedish Academy of War Sciences Medal for his work that led to the development of the new tactical flight combat suit for Sweden's Gripen fighter.

The award, established in the 19th century by Carl XIV Johan, King of Sweden and Norway, was presented to Dr. Balldin at Karlberg Castle in Stockholm. Dr. Balldin was elected permanent academician of the Royal Swedish Academy of War Sciences in 1991.

Earlier this year, he received the Thulin Medal in silver from the Swedish Society of Aeronautics and Astronautics in Stockholm.

The award recognized his research involving physiological effects of high G-loads on pilots.

"This work created new knowledge used in the development of the tactical flight combat suit system for the SAAB-built fighter aircraft Gripen presently being delivered to the Swedish Air Force. This anti-G suit system is now being operationally used in Gripen aircraft," Dr. Balldin said.

His on-going research at Brooks includes developing countermeasures for decompression sickness during high-altitude military flight and during space operations for the international space station.

He also serves as a faculty member at U.S. Air Force School of Aerospace Medicine located at Brooks and a clinical assistant professor at the Department of

Preventive Medicine and Community Health, University of Texas Medical Branch at Galveston.

— *Information provided by Mr. Rudy Purificato, 311th HSW*

British exchange officer earns award for research

BROOKS AIR FORCE BASE, Texas — Wing Commander Roger Matthews recently earned the prestigious Richard Fox-Linton Memorial Prize for his pioneering work at Brooks while assigned as a British exchange officer to the Air Force Research Laboratory's Human Effectiveness Directorate.

Mr. Matthews, a career Royal Air Force medical officer, was recognized for his work on spatial disorientation research conducted during his tour with the laboratory's flight motions protection branch.

The annual Fox-Linton Memorial Prize is presented to the medical officer who has made the most significant contribution to aviation medicine or flight safety.

He received the award in November in Great Britain. Royal Air Force Air Marshal Sir John Day, air member for personnel, and air vice-marshal Chris Sharples, director of general medical services, presented the award. The honor includes an engraved silver salver and a cash award.

His work supported previous Air Force Research Laboratory and U.S. Air Force School of Aviation Medicine research that focused on spatial disorientation countermeasures.

Spatial disorientation involves a host of airborne illusions and effects that have led to many military and civil aviation mishaps, most notably the 1998 crash that killed Mr. John F. Kennedy Jr.

— *Mr. Rudy Purificato, 311th HSW*

Youth center receives Excellence in Sports award

HANSCOM AIR FORCE BASE, Mass. — Hanscom's Youth Center is one of five facilities that earned an Excellence in Youth Sports Award Dec. 1 at the annual Athletic Business Conference held in Orlando, Florida.

"This first-ever award recognizes outstanding organizations that conduct multifaceted youth sports programs that focus on providing positive and safe experiences for all participants," said Mr. Greg

Bach, communications director for the National Alliance for Youth Sports.

National Football League Hall of Fame coach Mr. Don Shula presented the award, created by the National Alliance for Youth Sports and *Athletic Business* magazine, to the 66th Services Squadron's family members support flight chief, Mr. Terry Shaw, and youth center director, Mr. Scott Craver.

Numerous organizations across the United States, including youth centers from military bases in the Pacific and European region, competed for this award.

"Hanscom's youth center came out a winner because of their devotion to making new programs for children and young adults," said Mr. Shaw.

"Hanscom has demonstrated a strong commitment to the well-being of children and has embraced the importance of providing training to volunteer coaches, parents and youth league administrators," said Mr. Fred Engh, founder and president of the alliance.

ISignUpNow.com, an Internet sign-up provider, will donate \$5,000 to Hanscom's Youth Center and four other organizations to help them continue providing youth sports in their communities.

Each recipient will also be recognized in *Athletic Business* and the alliance's publications, as well as receive an award to display at their facility, according to Mr. Bach.

Hanscom's youth center staff hope the center can win again next year by establishing new programs for families and adding a new gymnasium floor.

Mr. Shaw said Electronic Systems Center commander, Lt. Gen. Leslie F. Kenne, 66th Air Base Wing commander, Col. Danny K. Gardner and 66th Support Group commander, Col. Robert Tovado supported the funding for the multipurpose floor and youth quality of life.

"Now we can offer indoor roller blading as well as basketball," said Mr. Shaw. "It will also allow us to expand our programs for family skate nights."

— *Mr. Areece Peak, ESC Public Affairs*



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